SABASTEANSKI, F.F.
1949

The Value of the Edgren Side-Stepping Test as a Predictor of Ability in Football, Hockey, Swimming, & Tennis.

BOSTON UNIVERSITY
SCHOOL OF EDUCATION

LIBRARY

Ed.
Thesis
F. F. Sabasteanski
1949

The Gift of F. F. Sabasteanski

Stored

Ed
Thesis
F.F Sabasteanski
1949

BOSTON UNIVERSITY

SCHOOL OF EDUCATION

Thesis

THE VALUE OF THE EDGREN SIDE-STEPPING TEST AS A PREDICTOR OF ABILITY IN FOOTBALL, HOCKEY, SWIMMING AND TENNIS

Submitted by

Frank Fabean Sabasteanski

(A. B., Bowdoin College, 1941)

In partial fulfillment of requirements for

The degree of Master of Education

1949

Boston University
School of Education
Library

Gift of
F. F. Sabasteanski
School of Education
June 17, 1949
31010

APPROVAL SHEET

First Reader: John M. Harmon, Professor of Physical Education

Second Reader: Arthur G. Miller, Instructor in Physical Education

Third Reader: Leslie W. Irwin, Professor of Health and Physical Education

TABLE OF CONTENTS

Table of Contents i

List of Tables ii

List of Figures iii

CHAPTER I Introduction 1

- The Purpose of the Study 1
- Justification of the study 1
- Reasons for selecting the Edgren Side-stepping Test 2
- The Test Itself 3

CHAPTER II Review of the Literature 4

- Tests used as predictors and screens 4
- Previous use of the Edgren side-stepping test 6
- Previous use of single item tests in measuring athletic ability 7

CHAPTER III The Method of Procedure 9

- Subjects used 9
- Administrative procedure 9
- Evaluation of athletic ability 10

CHAPTER IV Summary and Conclusions 12

- Findings 12
- Conclusions 12
- Recommendations 13

BIBLIOGRAPHY 14

APPENDICES 15

- A 15
- B 19
- C 24
- D 28

LIST OF TABLES

Table		Page
I	Pairings of Edgren Test Scores and Ability Rating in Football	15
II	Pairings of Edgren Test Scores and Ability Rating in Hockey	16
III	Pairings of Edgren Test Scores and Ability Rating in Swimming	17
IV	Pairings of Edgren Test Scores and Ability Rating in Tennis	18

Digitized by the Internet Archive
in 2016

https://archive.org/details/valueofedgrensid00saba

LIST OF FIGURES

Figure		Page
1.	Distribution of Edgren Test Scores in Football Squad	19
2.	Distribution of Edgren Test Scores in Hockey Squad	20
3.	Distribution of Edgren Test Scores in Swimming Squad	21
4.	Distribution of Edgren Test Scores in Tennis Squad	22
5.	Distribution of All Edgren Test Scores	23
6.	Scattergram from Pairings in Football	24
7.	Scattergram from Pairings in Hockey	25
8.	Scattergram from Pairings in Swimming	26
9.	Scattergram from Pairings in Tennis	27
10.	Correlation in Football Computed Directly from a Scatterdiagram	28
11.	Correlation in Hockey Computed Directly from a Scatterdiagram	29
12.	Correlation in Swimming Computed Directly from a Scatterdiagram	30
13.	Correlation in Tennis Computed Directly from a Scatterdiagram	31

CHAPTER I

INTRODUCTION

Purpose of the Study. The purpose of this study is to determine, by actual tests and comparisons, the value of the Edgren Side-stepping Test as a predictor of athletic ability among college men. In particular we are interested in how this test correlates with ability in football, hockey, swimming, and tennis, as determined by the coaches rating in these sports.

Justification of the Study. It is fundamentally true that the more we know about a test the better we can use it. Thus by using the Edgren Side-stepping Test in a large number of cases we can learn more about it and use it more effectively in the future. As for a more immediate and practical justification for the study, consider the following situation. It frequently happens that a coach of football, hockey, swimming, or tennis is confronted by a large squad at his initial practice session. He is faced with the necessity of cutting his squad in a very few days. It is humanly impossible for him or his assistants to give each and every man an adequate tryout. What is he going to do? Wouldn't it be

valuable to him if he knew of some simple, easily administered test by which he could separate the likely from the unlikely candidates? Numerous batteries of tests have been devised to test ability in basketball and football but they are hard to administer and are great time consumers. This test that we are considering is simple and easily and quickly administered.

Why the Edgren Test was Selected. Speaking of the Edgren Side-stepping test in his book, Tests and Measurements in Health and Physical Education,[1] Charles H. McCloy states:

> This simple test has shown itself to be a good one for predicting games and skills potentialities. It correlates highly with basketball ability and most probably, though as yet this has not been demonstrated, with other similar types of sports abilities such as tennis, hockey, soccer, speedball and football. When this test has been studied more carefully in a larger number of situations, it will probably be found to be a very useful one.

Additional reasons for the selection of this test ahead of others is because it is a test of coordination, agility and speed combined. Furthermore, in testing for native or potential ability it is best to use a test which is not likely to have been practiced, and the Edgren Side-stepping Test has this characteristic. And finally, a one item test, if found to have a high corre-

1. Charles H. McCloy, Tests and Measurements in Health and Physical Education. (New York: F. S. Crofts and Co., 1944), pp. 85-86.

lation, is naturally easier to administer.

The Test Itself. The Edgren Side-stepping Test[2] itself is very simple. Three parallel lines are drawn upon the floor four feet apart. The subject stands astride the middle line. Upon the signal to start, he sidesteps to the right until his right foot touches across the line to his right. He then sidesteps to his left until his left foot touches across the left hand line, repeating this movement to the right and left between the outside lines as rapidly as possible for ten seconds. Each step from the center to an outside line and back counts one point. Each round trip counts two points. Any variation of sidestepping may be used.

---

2. McCloy, loc. cit.

CHAPTER II

REVIEW OF THE LITERATURE

Literature concerning tests used as predictors and screens. With the concensus of expert gymnasts and coaches, Eugene Wettstone arrived at the thirty four qualities that make up a good gymnast.[1] To test the candidates for these qualities he subjected them to a battery of ten test items which included interest and determination; physical courage; coordination, quickness, and precision of movements; strength; kinesthetic sense and semi-circular canal function; flexibility; timing and sensory rhythms; motor rhythm; motor educability; and anthropometrical measurements.

The subjects were then observed for seven months and rated as to respective potentialities such as conference material (13 points), good varsity material (11 points), fair varsity material (9 points), poor varsity material (7 points), and non-varsity material (5 points), and grades in between. The scores were then correlated and the test was used primarily as a finding device.

---

1. Eugene Wettstone, "Tests for Predicting Potential Ability in Gymnastics and Tumbling," Research Quarterly, Vol. IX, No. 4, December 1938.

In the field of wrestling, Harry L. Seavers carried out a study paralleling that of Wettstone's in gymnastics.[2]

Hyman Krakower presented scientific proof of coaches' opinion as to what body type the best high jumpers had. He found that the type of individual who succeeds in the high jump has long legs, short body, and broad feet.[3]

Krakower's work confirms the study of C. O. Bemis.[4]

The head football coach of Woodrow Wilson High School, Long Beach, California, John Gartner, has for seven years used the following battery of tests to screen his football players.[5] In order, the tests items were 1) 50 yard dash, 2) dodge run, 3) defensive charging, 4) offensive charging, 5) 220 yard dash. He claims that he can administer the test to fifty boys in three hours, and that good players consistently scored high and poor players consistently scored low on this test.

---

2. Harry L. Seavers, "The Measurement of Potential Wrestling Ability," Master's Thesis, State University of Iowa. August, 1932.

3. Hyman Krakower, "Skeletal Characteristics of the High Jumper," Research Quarterly, Vol. VI, No. 2 May 1935.

4. C. O. Bemis, "Physical Characteristics of the Runner and Jumper," American Physical Education Review, V Sept. 1900, 235.

5. John Gartner, "A 'Screening' Device for Football Ability," Scholastic Coach, September 1943.

D. K. Brace[6] claims that the following battery of tests could be profitably used to select football players; 1. Forward pass at a target, 2. 50 yard dash carrying a football, 3. Forward pass for distance, 4. Pull, 5. Blocking, 6. Punting for distance, 7. Dodge and run (Cozen's), 8. and Charging. He also stated that the best single item was the fifty yard dash.

Previous use of the Edgren Side-stepping Test. In a very interesting study H. D. Edgren[7] proposed the following questions:

1. Can a series of tests be developed which would adequately measure progress in basketball?

2. Can a series of tests be developed which might be used as a means of predicting potential basketball ability?

3. Is there any carryover from specific basketball skills to general ability skills?

In order to solve these questions he used three types of tests:

1. Specific tests for basketball ability, including speed pass; accuracy pass; accuracy shooting; pivot and shoot; dribble; dribble and shoot; ball handling; and opposition shots.

---

6. D. K. Brace, "Validity of Football Achievement Tests as Measures of Motor Learning and as A Partial Basis for Selecting Players," Research Quarterly, Vol. IX, No. 3. October 1943.

7. H. D. Edgren, "An Experiment in the Testing of Ability and Progress in Basketball," Research Quarterly Vol. III, No. 1. March 1932.

2. Tests for general athletic ability, including agility (jump and reach); endurance (stair test); and coordination (the Edgren side stepping test).

3. The Brace Motor Ability Tests.

His conclusions were that:

> To objectively test an individual for potential basketball ability the test must of necessity measure untaught skills. If this were not so the individual could not be tested on his first appearance and the individual who had never played basketball would automatically be ruled out. The high correlation between general scores and specific basketball scores on the one hand, and general ability scores on the other hand, which are brought out in this study seem to warrant the use of the general ability test as a predictive test for potential playing ability.[8]

Previous use of single item test in measuring athletic ability. Studying the Sargent Jump, Charles H. McCloy[9] stated that Bovard and Cozens[10] found a correlation of .55 between the Sargent Jump and the running high jump, standing broad jump, rope climb for speed, and the 880 yard run. He further states that the Sargent Jump, when standardized, practiced and correctly administered is undoubtedly a valuable test. It does not test all of the elements of general motor ability. When combined with

---

8. Edgren, op. cit.

9. Charles H. McCloy, "Recent Studies in the Sargent Jump," Research Quarterly, Vol. III, No. 2 May 1932.

10. J. F. Bovard and F. W. Cozens, "The Leap Meter," University of Oregon Pub., Eugene, Oregon; Phys. Ed. Series 1, No. 2, 1928

other tests he found that the battery correlates about .93 (not corrected for attenuation) with a large number of achievement tests. The Sargent Jump is not the one perfect test, but it is probably one of the best for predicting explosive energy.

CHAPTER III

THE METHOD OF PROCEDURE

Subjects used. As subjects for this study, the varsity squads of football, hockey, swimming, and tennis of Bowdoin College at Brunswick, Maine were used.

Administrative procedure. In all four sports the following administrative set-up was used; one timer, with a ten second stop watch; one recorder, to put down the data as received; and one observer (the author), who gave the signal to start and counted the score on the test. The timer gave the signal to stop when the ten seconds were up. The recorder entered beside the subject's name the score on the test as given to him by the observer. The timers and recorders were different men for each sport; but the observer, who was the author, supervised all testing.

In football, the three test lines were drawn upon turf and the subjects took the test in regular football shoes, pants, and jerseys. They wore no hip and kidney pads or shoulder harness.

In hockey and swimming, the test lines were drawn upon a concrete floor and the subjects wore sneakers

and gym clothes when taking the test.

In tennis, the test lines were drawn upon turf and the subjects wore sneakers and tennis clothing when they took the test.

The test itself was carefully explained to all subjects before taking the test. Nobody had a chance to practice the test beforehand. Several subjects were tested more than once because they were members of more than one squad; however, there was no noticeable increase in their scores due to previous testing.

Evaluation of Athletic Ability. In order to arrive at an evaluation of the individual's performance in a sport, the following procedure was used. At the end of each season, each squad was rated man-to-man by it's respective coach or coaches and each individual was given a numerical rating according to his rank. In football there were three coaches, in swimming there were two, and in tennis and hockey there was one each. This man-to-man rating was the carefully considered, expert, estimation by the coach or coaches of the man's ability in his particular sport.

The test itself was given at the beginning of the season and the coaches rating was taken at the end of the season. Then these two scores were correlated to determine the coefficient of correlation, thus determining

the value of the Edgren Side-stepping test as a predictor of ability in football, hockey, swimming and tennis.

Chapter IV

Summary

Findings. The distribution curves of all groups tested were normal, as was that of the total group. Preliminary scatter diagrams showed no straight line correlation for any group. The coefficients of correlation were computed directly from scattergrams. Below will be found a chart embodying all the findings of this study. None of the correlations are corrected for attenuation because the low correlations hardly make it worthwhile.

FINDINGS OF THIS STUDY

Squad	* N	** M	*** r
Football	49	12.33	.22
Hockey	35	11.20	.25
Swimming	44	9.70	.44
Tennis	29	11.88	.40

* N is the number of subjects
** M is the median
*** r is the coefficient of correlation

Conclusions. With the highest correlation in the group being a mere .44, the Edgren side-stepping test can hardly be said to be a good predictor of ability in football,hockey,swimming,or tennis.It is surprising that the

highest correlation, .44, was obtained in swimming. However when one considers that swimming is a sport that depends upon pure individual effort and lacks physical contact, perhaps this is not so surprising. The second highest correlation, .40, was achieved in tennis. Here to is a sport that involves less team work,more individual effort,and less contact.The lowest two correlations, .25 and .22, were found in hockey and football respectively.These are sports that require team work and involve a lot of contact.

Recommendations. It is the opinion of the author that the chief trouble with the Edgren Side-stepping Test as a predictor of athletic ability is that it does not test enough things that are pertinent too sports. For instance it in no way measures courage,determination,or interest,which in the contact sports of football and hockey are very important. Again in swimming,to what avail is a high score on the test,if the subject cannot swim. No high scorer on the test could ever become a tennis player if he were unable to master forehands,backhands,and the service.In other words the test seems to be a good one if used only as one item in a battery, the other items being those which measure skills pertinent to the sport in question.

BIBLIOGRAPHY

BIBLIOGRAPHY

A. BOOKS

Edwards, Allen L., Statistical Analysis for Students in Psychology and Education. New York: Rinehart and Company, 1946. 360 pp.

McCloy, Charles H., Tests and Measurements in Health and Physical Education. New York: F. S. Crofts and Company, 1944. 412 pp.

B. PERIODICAL LITERATURE

Bemies, C. O., "Physical Characteristics of the Runner and Jumper," American Physical Education Review, V (September 1900).

Bovard, J. F. and Cozens, F. W., "The Leap Meter," University of Oregon Pub., Eugene, Oregon; Phys. Ed. Series I, No. 2, 1928.

Brace, David K., "An Experiment in the Testing of Ability and Progress in Basketball," Research Quarterly, III (May 1932), No. 2.

Gartner, John , "A 'Screening' Device for Football Ability," Scholastic Coach, September 1943.

Krakower, Hyman, "Skeletal Characteristics of the High Jumper," Research Quarterly, IV (May 1935), No. 2.

McCloy, Charles H., "Recent Studies in the Sargent Jump," Research Quarterly, III (May 1932), No. 2

Wettstone, Eugene, "Tests for Predicting Potential Ability in Gymnastics and Tumbling," Research Quarterly, II (December 1938), No. 4.

UNPUBLISHED LITERATURE

Seavers, Harry L., "The Measurement of Potential Wrestling Ability," Master's Thesis, State University of Iowa, August 1932.

APPENDIX A

TABLE 1

PAIRINGS OF MAN-TO-MAN RATINGS AND EDGREN TEST SCORES

FOOTBALL

Subject	Rating	Test Score	Subject	Rating	Test Score
McAvoy	28	13.5	Newton	16	16
Lovejoy	28	12	Butler,J.	15	11
Lee	27	14.5	Fortin	14	11
Draper	27	12.5	Bailey	13	11.5
Sibson	26	12	Graff	12	12.5
Zdanowicz	25	12	Thorburn	11	9.5
Fife	25	12	Wright	10	11.5
Beem	24	14	Alden	10	11
Ireland	23	14.5	Simonton	9	12.5
Slattery	23	11	Robinson	9	14.5
Dougherty	22	12.5	Sabasteanski,J.	9	13.5
Staples	22	12	Reardon, W.	8	13.5
Donovan	22	14	Daley	7	10
Begley	21	11	Aker	7	11
Dobie	21	11	Early	6	11.5
Angeramo	20	12	Holden	5	11
Burke	20	12	Smith, B.	4	10.5
Gillen	20	13	Beahm	4	11
Beckler	20	11	Stackpole	3	11
Toomey	20	15	Toscani	3	13
Pitcher	19	13.5	Howe	2	13
Williams	18	14.5	Huen	2	14.5
Veale	17	12.5	MacInness	1	15.5
Nicholson	17	12	Lewsen	1	9.5
Reardon, H.	17	11			

TABLE 2

PAIRINGS OF MAN-TO-MAN RATINGS AND EDGREN TEST SCORES

HOCKEY

Subject	Rating	Test Score	Subject	Rating	Test Score
Hansen, H.	27	13.5	Bonzagni	13	14
Archibald	26	11.5	Fleming	12	10.5
King	25	10	Atwood	11	10
Fife	24	12	Hansen, G.	10	9.5
Norton	23	12	Badger	9	10.5
Blanchard	22	10	Clarke	9	10.5
Ireland	22	14.5	Haskell	8	9
Leason	22	8.5	Graham	8	10
Burke	21	13	Morrell	8	11
Taylor	20	12.5	Scates	7	12.5
Crockford	20	12	Simonds	7	13.5
Field	19	13	Beahm	6	11
Arnold	18	10.5	Quaile	5	10.5
Packard	17	9	Howe	4	8
Porteous	17	9.5	Brown	3	10
Homer	16	11.5	Stephenson	2	12.5
Daley	15	12	Stinneford	1	11
Draper	14	13			

TABLE 3

PAIRINGS OF MAN-TO-MAN RATINGS AND EDGREN TEST SCORES

SWIMMING

Subject	Rating	Test Score	Subject	Rating	Test Score
Merrow	28	11	Lancaster	13	8
Ingraham	27	10	Dennis	13	9
Soltysiak	26	10.5	Berwind	13	10
Blake	25	8	Harrison	12	11
Gath	24	9	Sistaire	11	10
McGowan	24	13	Kyle	11	10
Wheeler	23	9	Barnstone	10	12.5
Moran	22	10.5	Watson	9	10.5
Grant	21	12	Reid	9	8
Erswell	21	9	Greene	9	10
Zeitler	20	9.5	Strang	9	9
Blaine	19	10	Schenk	8	10
Loomer	18	11	Boyd	8	9.5
Mitchell	17	11	Huntoon	7	8
Curry	17	11	Lawless	6	9.5
Williams	16	8.5	Patton	5	8
Thomas	15	8	Noxon	5	7
Van Voast	15	8.5	McMahon	5	8
Oehrle	15	10	Giffin	4	9
Reiche	15	11.5	Tornquist	3	8
Pidgeon	14	9	Malone	2	8
Page	13	8.5	Bishop	1	8

TABLE 4

PAIRINGS OF MAN-TO-MAN RATINGS AND TEST SCORES

TENNIS

Subject	Rating	Test Score	Subject	Rating	Test Score
Branche	29	14	Hubley	14	13
Fleming	28	10.5	Harrington	13	13
Rosander	27	12	Packard	12	10.5
Hebb	26	13	Reid	11	11
Watson	25	13	Queen	10	11
Cay	24	13	Kelley	9	13
Foster	23	14.5	McLeod	8	12
Noyes	22	10	Fox	7	12
Williams	21	13	Patterson	6	10.5
Hallet	20	13	Hworschinsky	5	10
Edson	19	12	Hansen	4	12.5
Willey	18	12.5	Boots	3	11.5
Cole	17	11	Dulfer	2	11
Paull	16	10	Ashe	1	10
Arnold	15	12			

APPENDIX B

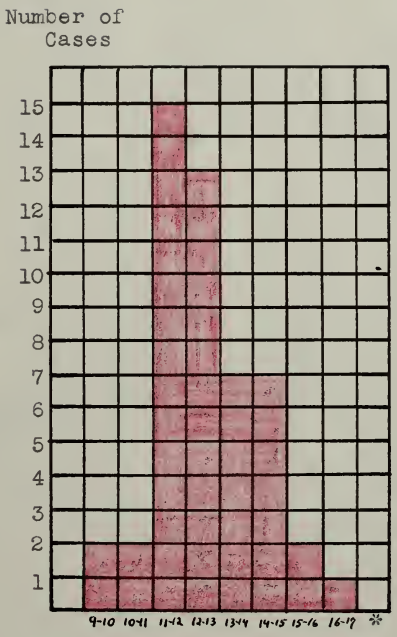


FIGURE 1

DISTRIBUTION OF EDGREN TEST SCORES IN FOOTBALL SQUAD

* The block (9-10) includes scores of 9 and 9.5, etc.

\# The score on this and the three graphs following count the movement from the center line to either outside line and back as one, and the test lasts for 10 seconds. See The Test Itself.

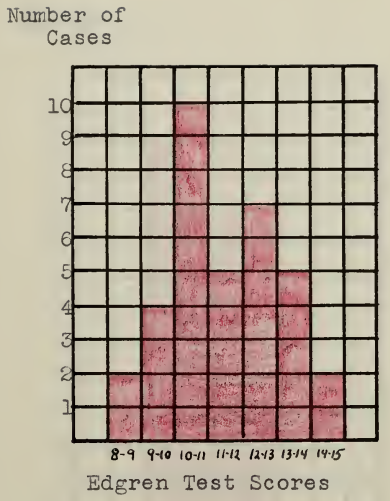


FIGURE 2

DISTRIBUTION OF EDGREN TEST SCORES IN HOCKEY SQUAD

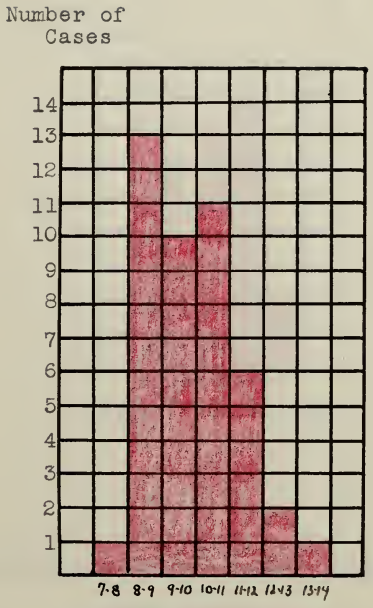


FIGURE 3

DISTRIBUTION OF EDGREN TEST SCORES IN SWIMMING SQUAD

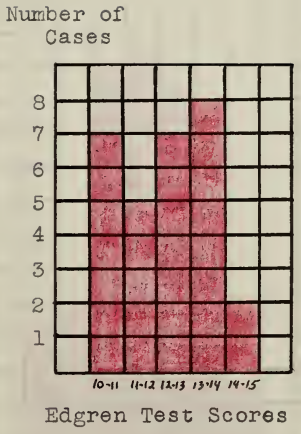


FIGURE 4

DISTRIBUTION OF EDGREN TEST SCORES IN TENNIS SQUAD

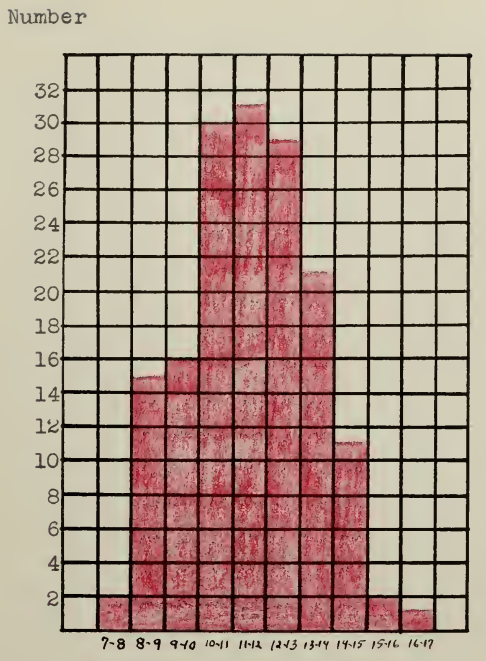


FIGURE 5

DISTRIBUTION OF ALL EDGREN TEST SCORES

APPENDIX C

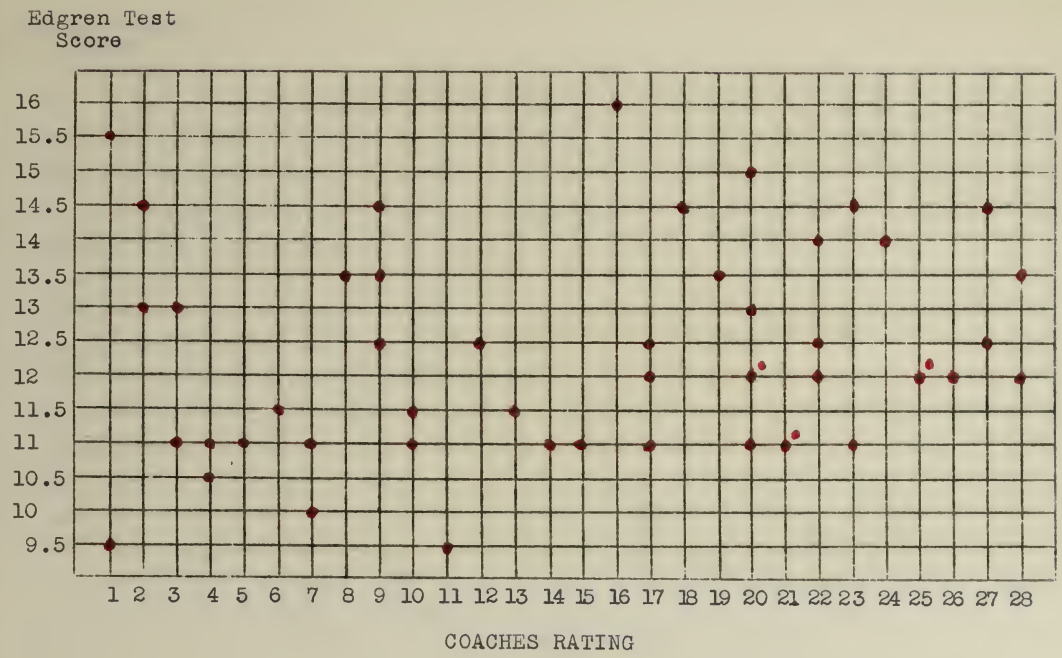


FIGURE 6

SCATTERGRAM FROM PAIRINGS IN FOOTBALL

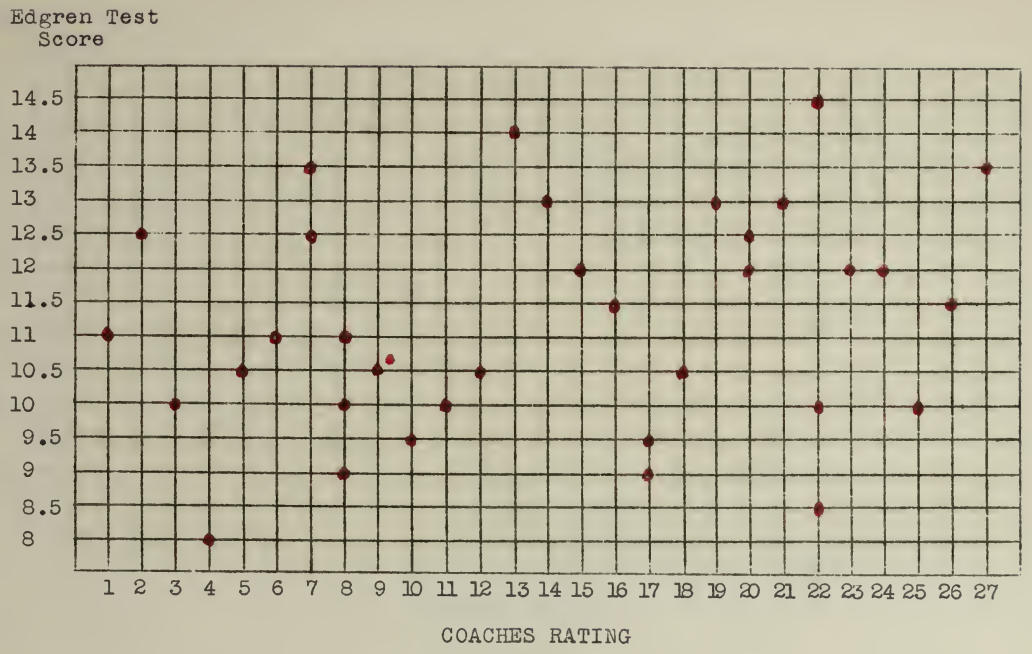


FIGURE 7

SCATTERGRAM FROM PAIRINGS IN HOCKEY

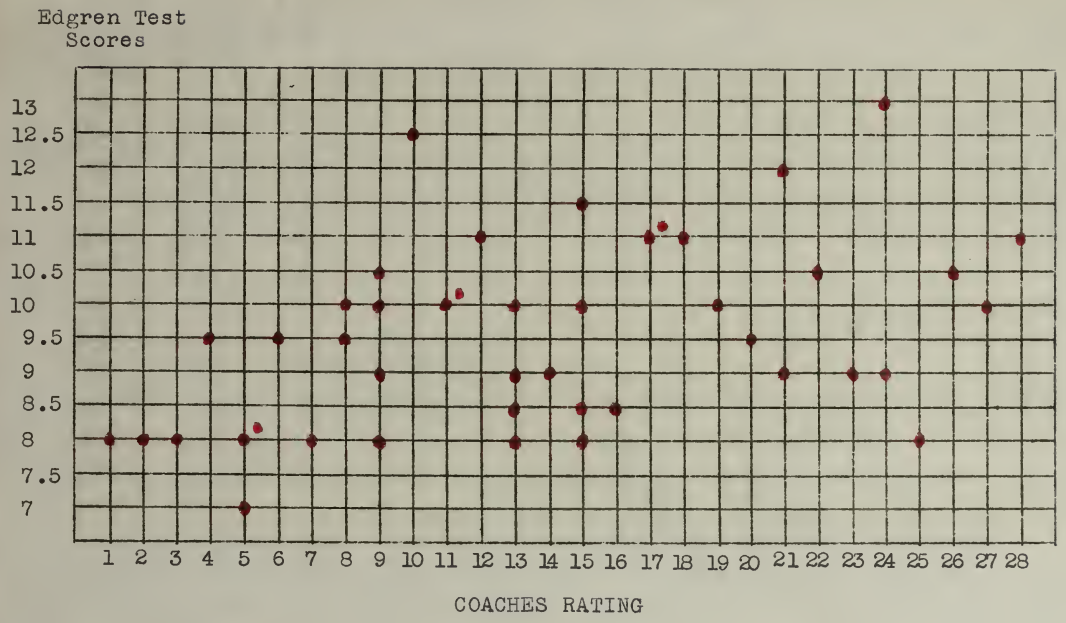


FIGURE 8

SCATTERGRAM FROM PAIRINGS IN SWIMMING

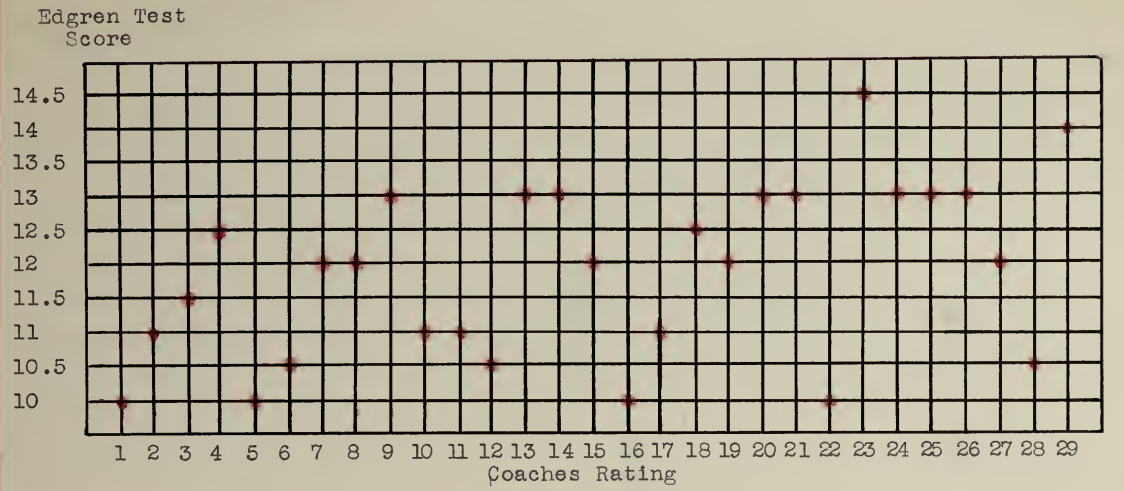
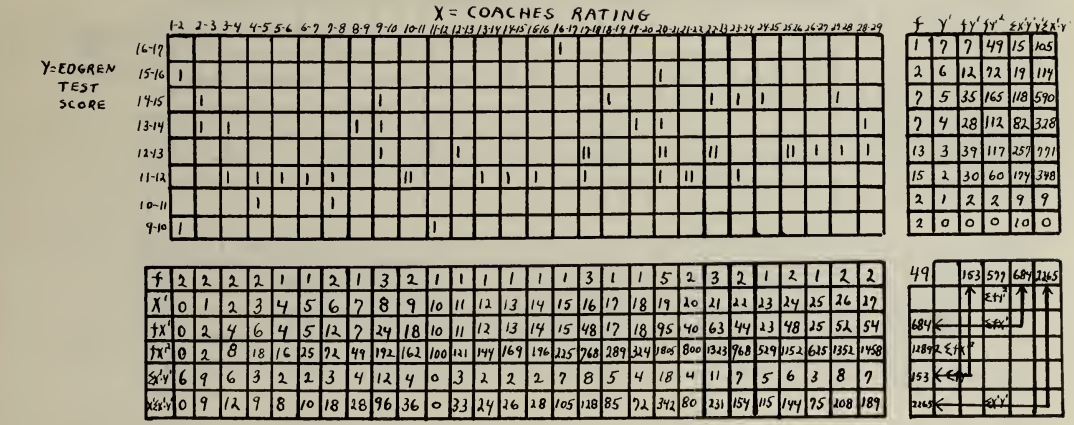


FIGURE 9

SCATTERGRAM FROM PAIRINGS IN TENNIS

APPENDIX D



$$\Sigma xy = \left[\Sigma x'y' - \frac{(\Sigma fx')(\Sigma fy')}{N}\right]$$

$$= 2265 - \frac{(684)(153)}{49}$$

$$= 2265 - 2135.75$$

$$\Sigma xy = 129.25$$

$$\Sigma x^2 = \left[\Sigma fx'^2 - \frac{(\Sigma fx')^2}{N}\right]$$

$$= 12892 - \frac{(684)^2}{49}$$

$$= 12892 - 9956.24$$

$$\Sigma x^2 = 2846.25$$

$$\Sigma y^2 = \left[\Sigma fy'^2 - \frac{(\Sigma fy')^2}{N}\right]$$

$$= 577 - \frac{(153)^2}{49}$$

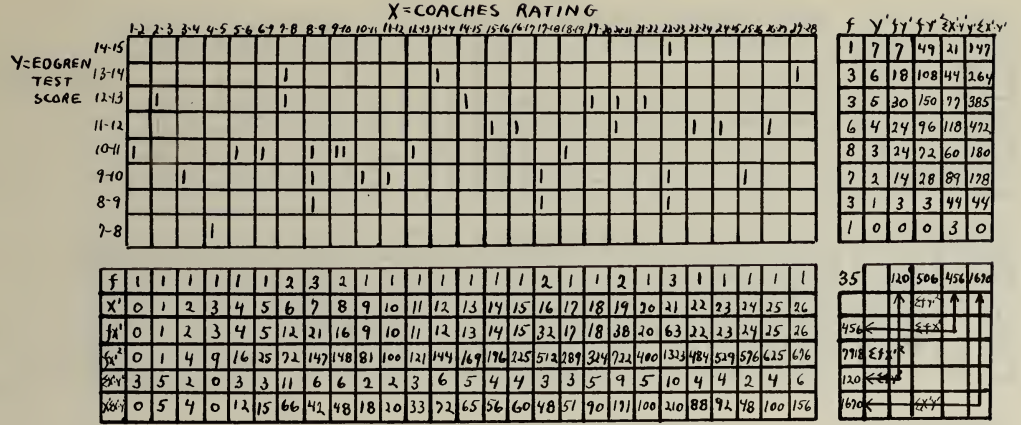
$$= 577 - 477.73$$

$$\Sigma y^2 = 99.27$$

$$r_{xy} = \frac{\Sigma xy}{\sqrt{\Sigma x^2 \Sigma y^2}} = \frac{129.25}{\sqrt{(2846.96)(99.27)}} = \frac{129.25}{531.59} = .22 \qquad \therefore r_{xy} = .22$$

FIGURE 10

CORRELATION IN FOOTBALL COMPUTED DIRECTLY FROM A SCATTERDIAGRAM



$$\Sigma xy = \left[\Sigma fx'y' - \frac{(\Sigma fx')(\Sigma fy')}{N}\right]$$

$$= 1670 - \frac{(456)(120)}{35}$$

$$= 1670 - 1563.43$$

$$\Sigma xy = 106.57$$

$$\Sigma x^2 = \left[\Sigma fx'^2 - \frac{(\Sigma fx')^2}{N}\right]$$

$$= 7918 - \frac{(456)^2}{35}$$

$$= 7918 - 5941.03$$

$$\Sigma x^2 = 1976.97$$

$$\Sigma y^2 = \left[\Sigma fy'^2 - \frac{(\Sigma fy')^2}{N}\right]$$

$$= 506 - \frac{(120)^2}{35}$$

$$= 506 - 411.43$$

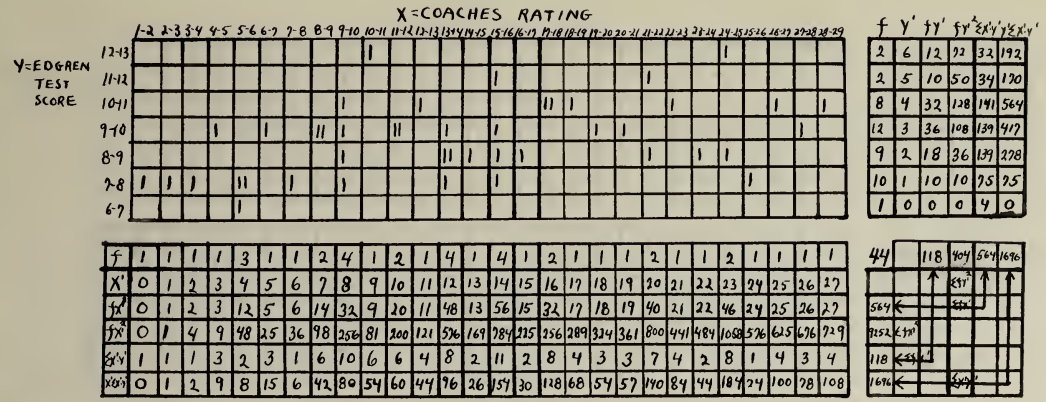
$$\Sigma y^2 = 94.57$$

$$r_{xy} = \frac{\Sigma xy}{\sqrt{\Sigma x^2 \Sigma y^2}} = \frac{106.57}{\sqrt{(1976.97)(94.57)}} = \frac{106.57}{431.58} = .25$$

$$\therefore r_{xy} = .25$$

FIGURE 11

CORRELATION IN HOCKEY COMPUTED DIRECTLY FROM A SCATTERDIAGRAM



$$\Sigma xy = \left[\Sigma fx'y' - \frac{(\Sigma fx')(\Sigma fy')}{N}\right]$$

$$= 1696 - \frac{(564)(118)}{44}$$

$$= 1696 - 1512.55$$

$$\Sigma xy = 183.45$$

$$\Sigma x^2 = \left[\Sigma fx'^2 - \frac{(\Sigma fx')^2}{N}\right]$$

$$= 9252 - \frac{(564)^2}{44}$$

$$= 9252 - 9229.45$$

$$\Sigma x^2 = 2022.55$$

$$\Sigma y^2 = \left[\Sigma fy'^2 - \frac{(\Sigma fy')^2}{N}\right]$$

$$= 404 - \frac{(118)^2}{44}$$

$$= 404 - 316.45$$

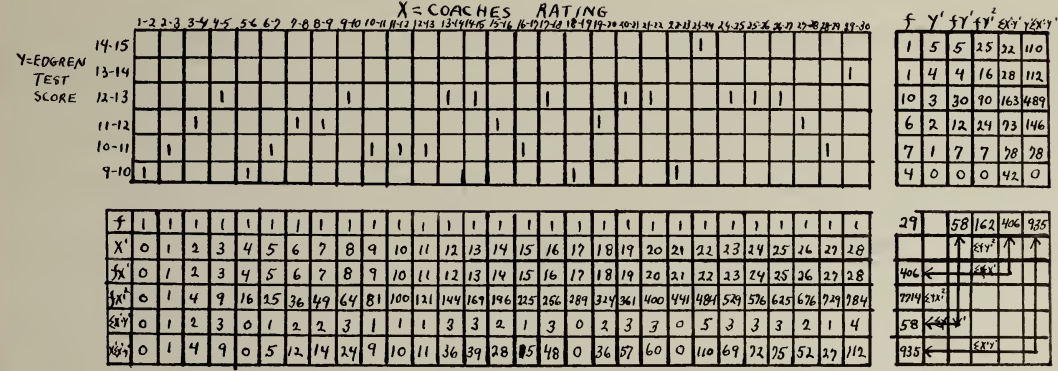
$$\Sigma y^2 = 87.55$$

$$r_{xy} = \frac{\Sigma xy}{\sqrt{\Sigma x^2 \Sigma y^2}} = \frac{183.45}{\sqrt{(2022.55)(87.55)}} = \frac{183.45}{420.80} = .44$$

$$\therefore r_{xy} = .44$$

FIGURE 12

CORRELATION IN SWIMMING COMPUTED DIRECTLY FROM A SCATTERDIAGRAM



$$\Sigma xy = \left[\Sigma x'y' - \frac{(\Sigma fx')(\Sigma fy')}{N}\right]$$

$$= 935 - \frac{(406)(68)}{29}$$

$$= 935 - 812$$

$$\Sigma xy = 123$$

$$\Sigma x^2 = \left[\Sigma fx'^2 - \frac{(\Sigma fx')^2}{N}\right]$$

$$= 7714 - \frac{(406)^2}{29}$$

$$= 7714 - 5684$$

$$\Sigma x^2 = 2030$$

$$\Sigma y^2 = \left[\Sigma fy'^2 - \frac{(\Sigma fy')^2}{N}\right]$$

$$= 162 - \frac{(68)^2}{29}$$

$$= 162 - 116$$

$$\Sigma y^2 = 46$$

$$r_{xy} = \frac{\Sigma xy}{\sqrt{\Sigma x^2 \Sigma y^2}} = \frac{123}{\sqrt{(2030)(46)}} = \frac{123}{305.54} = .40$$

$$\therefore r_{xy} = .40$$

FIGURE 13

CORRELATION IN TENNIS COMPUTED DIRECTLY FROM A SCATTERDIAGRAM

BOSTON UNIVERSITY
1 1719 02549 5005